PATENT ABSTRACTS OF JAPAN

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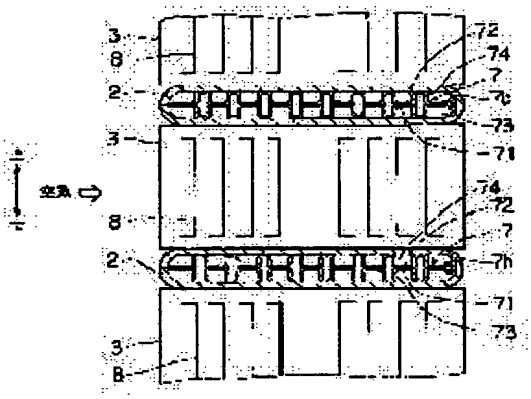
(54) HEAT EXCHANGER

(57)Abstract:
PROBLEM TO BE SOLVED: To increase withstand pressure of a flat tube in a heat exchanger having an inner fin.
SOLUTION: An inner fin 7 is formed by folding a thin plate 7a where first and second protrusions 73, 74 are formed only on a one surface side. Hereby, first and second flat plate parts 71, 72 of the inner fin 7 are securely brought into contact with each other so that both are securely brazed. Accordingly, inner walls of mutually opposing tubs 2 via the inner fin 7 are joined with each other so that withstand pressure of the flat tube 2 is improved.



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* NOTICES *

CLAIMS

[Claim(s)]
[Claim 1] While a fluid circulates, and a cross-section configuration is established in the flat tube (2) formed in the shape of flat, and said flat tube (2) and spreading in the major-axis direction and longitudinal direction of said flat tube (2) The 1st and the 2 monotonous sections (71 72) which lap in the direction of a minor axis of said flat tube (2), said every — the 1st and 2 height (73 74) which projects from the 1st and the 2 monotonous sections (71 72), and contacts the wall of said flat tube (2), and said 1st [the] and the 2 monotonous sections (71 72) The heat exchanger characterized by being formed by bending sheet metal (7a) by the part corresponding to the major-axis direction end side of said flat tube (2).
[Claim 2] the [said] — total of the surface area of said 1st height (73) formed in the 1 monotonous section (71) — the [said] — the heat exchanger according to claim 1 characterized by the large thing compared with total of the surface area of said 2nd height (74) formed in the 2 monotonous sections (72).
[Claim 3] The heat exchanger according to claim 1 or 2 characterized by forming in the part corresponding to the major-axis direction end side of said flat tube (2) the bending section (7b) which bent said sheet metal (7a) among said 1st [the] and the 2 monotonous sections (71 72).

[Translation done.]

* NOTICES *

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention applies and is effective in the heat exchanger which has the member which increases a touch area with fluids (refrigerant), such as an inner fin, in a tube about a heat exchanger.
[0002]
[Description of the Prior Art] For example, the height which projects towards the other side in each flat part of the pair which opposes mutually among the walls of a flat-like tube is really fabricated in JP,4-240395,A with a tube, and the heat exchanger which soldered the tip of the height mutually is proposed.
[0003]
[Problem(s) to be Solved by the Invention] By the way, with the forming roller, a heat exchanger given in the above-mentioned official report forms a height in the part corresponding to the wall of a tube, centering on the part corresponding to the circular section which connects each flat part, bends this plate to the plate which constitutes a tube, and forms the tube in it after that.
[0004] For this reason, possibility that the part which contacts mutually among the tips of the height formed in each flat part depending on the location based on [which bends a plate] bending, and the part which does not contact will occur is high, and possibility that the height each other soldered and the height which is not soldered will occur is high (junction variation is large). Therefore, if the variation in the pressure resistance as a heat exchanger (tube) becomes large and this variation is taken into consideration, the fall of the pressure resistance which can be guaranteed as a finished product will be caused.
[0005] This invention aims at having the part which increases a touch area with a fluid in a tube in view of the point describing above, and raising the pressure resistance of a tube.
[0006]
[Means for Solving the Problem] In order to attain the above-mentioned purpose, the following technical means are used for this invention. in invention according to claim 1 to 3, the 1st and the 2 monotonous sections (71 72) which lap in the direction of a minor axis prepare in a flat tube (2) -- having -- **** -- the 1st and the 2 monotonous sections (71 72) -- every -- the 1st and 2 height (73 74) which projects from the 1st and the 2 monotonous sections (71 72), and contacts the wall of a flat tube (2) is formed. And the 1st and the 2 monotonous sections (71 72) are characterized by being formed by bending sheet metal (7a) by the part corresponding to the major-axis direction end side.
[0007] Thereby, since the 1st and the 2 monotonous sections (71 72) can be contacted certainly, the 1st and the 2 monotonous sections (71 72) are certainly joinable with junction means, such as soldering. Therefore, since the wall of the flat tube (2) which counters mutually through the 1st, the 2 monotonous sections (71 72), and the 1st and 2 height (73 74) is joinable, the 1st, the 2 monotonous sections (71 72), and the 1st and 2 height (73 74) are effectively utilizable as a load member. As a result, the pressure resistance of a flat tube (2) can be raised.
[0008] moreover, a fluid -- each height (73 74) -- in addition, since the 1st and the 2 monotonous sections (71 72) are also contacted, the surface area of the part in contact with a

fluid can be increased. Therefore, the heat exchange capacity of a heat exchanger can be raised. In invention according to claim 2, total of the surface area of the 1st height (73) is characterized by the large thing compared with total of the surface area of the 2nd height (74).
[0009] By the way, in the condenser which makes a refrigerant condense, if the heat exchange of a refrigerant progresses like the after-mentioned, since the liquid phase (it condensed) refrigerants in a flat tube (2) will gather to a lower part side among the walls of a flat tube (2), the amount of heat transfers (heat exchange capacity) will fall. On the other hand, in this invention, since total of the surface area of each height (73 74) differs, if the 1st height 73 is arranged in the lower part side in which liquid phase refrigerants gather and the 2nd height 74 is arranged in an upper part side, the fall of the amount of heat transfers by the side of a lower part can be prevented. Therefore, pressure resistance can be raised, aiming at improvement in heat exchange capacity.
[0010] In addition, the sign in the parenthesis of each above-mentioned means shows correspondence relation with the concrete means given in an operation gestalt mentioned later.
[0011]
[Embodiment of the Invention]
(The 1st operation gestalt) This operation gestalt is a thing with the application of the heat exchanger concerning this invention at the condenser (capacitor) of a refrigerating cycle, and drawing 1 is the perspective view of a condenser 1. Two are two or more flat tubes (it abbreviates to a tube hereafter.) with which a refrigerant circulates among drawing 1 , and 3 is the corrugated fin (wavelike) (outer fin) soldered between tubes 2. Moreover, 4 is the 1st tank section which distributes a refrigerant to each tube 2, and 5 is the 2nd tank section which gathers the refrigerant (it condensed) which finished heat exchange by each tube 2. In addition, both the tank sections 4 and 5 are soldered at the tube 2 with the side plate 6 which makes the reinforcement member of the core section (generic name with a tube 2 and a fin 3).
[0012] and as a tube 2 is shown in drawing 2 (sectional view which cut the core section in the circulation direction of air), the cross-section configuration is formed in the shape of flat -- both, it is arranged so that the major-axis direction may be in agreement with the circulation direction of air. In the tube 2, the inner fin 7 which increases a touch area with a refrigerant and raises heat exchange capacity is arranged. Moreover, this inner fin 7 With 1st Taira Itabe 71 and 2nd Taira Itabe 72 who lap in the direction of a minor axis of a tube 2 while spreading in the major-axis direction and longitudinal direction of a tube 2 every -- it consists of pin-like (cylindrical) the 1st height 73 and the 2nd height 74 of an a large number book which project from the 1st and the 2 monotonous sections 71 and 72, and contact the wall of a tube 2. In addition, 8 is the louver of the common knowledge started in the shape of a louver from the fin 3.

[0013] Next, the manufacture approach of a tube 2 (the inner fin 7 is included) is explained using drawing 3 . First, as shown in (a) of drawing 3 , press forming of the plate 2a made from aluminum (this operation gestalt thickness of 0.4mm) which constitutes a tube 2 is carried out to a predetermined configuration (configuration developed focusing on the major-axis direction end side of a tube 2). As only the one side side of sheet metal 7a made from aluminum (this operation gestalt thickness of 0.1mm) with which wax material was covered on the other hand by both sides which constitute the inner fin 7 projects, press forming of the 1st and 2 heights 73 and 74 is carried out.
[0014] Next, while carrying out temporary immobilization with a fixture etc., heating in a furnace, while bending plate 2a and sheet metal 7a centering on the part corresponding to the major-axis direction end side of a tube 2, as shown in (a) of drawing 3 , and soldering mutually the 1st and the 2 monotonous sections 71 and 72, the tip of heights 73 and 74 is soldered to the wall of a tube 2. And mating-face 2b of plate 2a is joined by welding after the completion of soldering.
[0015] Next, the description of this operation gestalt is described. With this operation gestalt, since the inner fin 7 bends sheet metal 7a in which the 1st and 2 heights 73 and 74 were formed and is formed only in the one side side, it can contact certainly the 1st and the 2 monotonous sections 71 and 72. For this reason, since soldering junction of the 1st and the 2 monotonous sections 71 and 72 can be carried out certainly, the wall of the tube 2 which counters mutually

through the inner fin 7 is joinable. Therefore, since the inner fin 7 is effectively utilizable as a load member, the pressure resistance of a tube 2 can be raised.
[0016] Moreover, since a refrigerant also contacts the 1st and the 2 monotonous sections 71 and 72 in addition to each heights 73 and 74, it can increase the surface area of the inner fin 7 in contact with a refrigerant. Therefore, the heat exchange capacity of a condenser 1 can be raised.
(The 2nd operation gestalt) As shown in drawing 4 , this operation gestalt is formed in 1st Taira Itabe 71, and enlarges total of the surface area of 1st ******** 73 compared with total of the surface area of the 2nd height 74 formed in 2nd Taira Itabe 72.
[0017] That is, in a condenser, if the heat exchange of a refrigerant progresses, the liquid phase (it condensed) refrigerants in a tube 2 will gather to a lower part side among the walls of a tube 2 (refer to drawing 5). And the area of the part where these liquid phase refrigerants gather reaches about 50% of the sum of the surface area of the inner fin 7, and the internal-surface product of a tube 2, and it is further checked by test examination of an artificer etc. in this part that the amount of heat transfers gets worse to about 15% of other parts (fall).
[0018] Then, the fall of the amount of heat transfers can be prevented like this operation gestalt by enlarging total of the surface area of the 1st height 73 which is the lower part side in which liquid phase refrigerants gather compared with total of the surface area of the 2nd height 74. Therefore, pressure resistance can be raised, raising the capacity of a condenser 1. Incidentally with this operation gestalt, total of the surface area of a height 73 is the total [about 1.5 times] of the surface area of a height 74.
[0019] By the way, when a tube 2 also bent plate 2a, it fabricated with the above-mentioned operation gestalt, but after inserting the inner fin 7 bent and fabricated like this invention in the tube already fabricated in the shape of tubing like extruding (drawing processing) tubing or a welded tube, the inner fin 7 and a tube may be soldered. moreover, with an above-mentioned operation gestalt, among the 1st and the 2 monotonous sections 71 and 72 in the part corresponding to the major-axis direction end side of a tube 2 Although it had bending section 7b formed when sheet metal 7a is bent (refer to drawing 2), this bending section 7b is inevitably formed at the time of manufacture, and the 1st and the 2 monotonous sections 71 and 72 may fracture it in bending section 7b after completion of a tube 2 (condenser 1).
[0020] Moreover, the configuration of the 1st and 2 heights 73 and 74 may be a projection configuration of others, such as a protruding line which is not limited in the shape of a pin and prolonged in the longitudinal direction of a tube 2. Moreover, you may also put the 1st and the 2 monotonous sections 71 and 72 with mating-face 2b of plate 2a. In addition, in this case, since [which is cursed inner fin 7] wax material is covered by sheet metal 7a, and mating-face 2b can be soldered while being attached, it can abolish like the welding operator after a soldering process.

[Translation done.]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the perspective view of a condenser.
[Drawing 2] It is the sectional view of the core section.
[Drawing 3] It is the perspective view showing the manufacture approach of a tube.
[Drawing 4] It is the sectional view of the core section of the condenser concerning the 2nd operation gestalt.
[Drawing 5] It is the mimetic diagram showing the condition of the refrigerant in a tube.
[Description of Notations]
a 2 — flat tube and 3 — a fin, the 4 — 1st tank section, the 5 — 2nd tank section, and 6 — the [a side plate, a 7 — inner fin, and / 71 —] — the [the 1 monotonous section and / 72 —] — the 2 monotonous sections, the 73 — 1st height, and the 74 — 2nd height.

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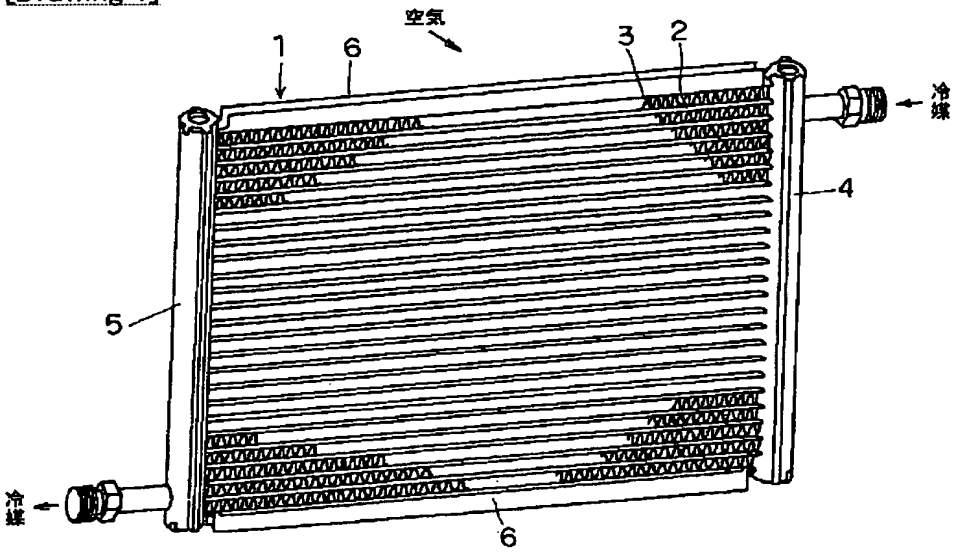
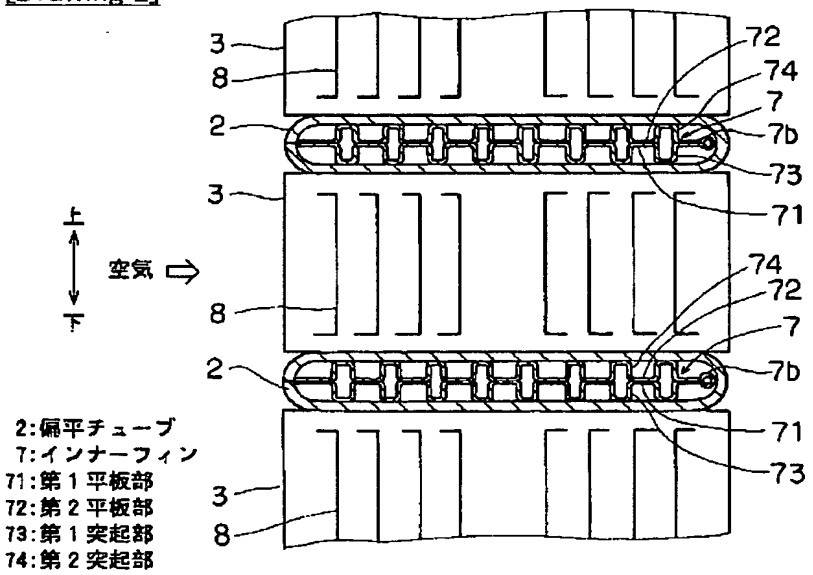
DRAWINGS

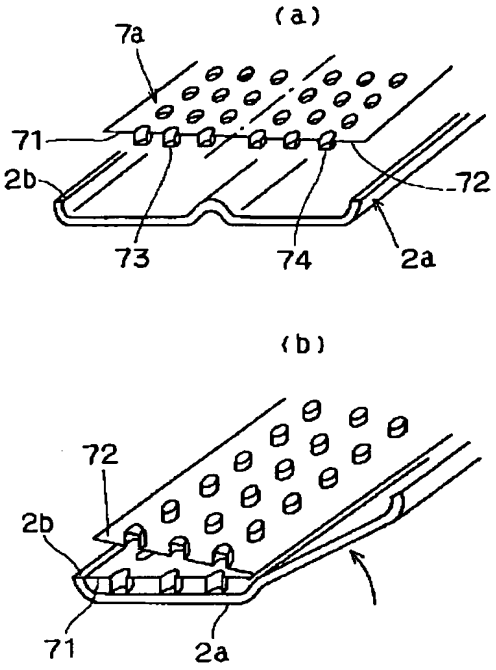
[Drawing 1]



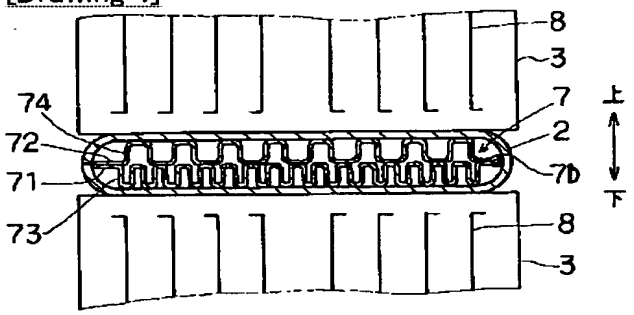
[Drawing 2]



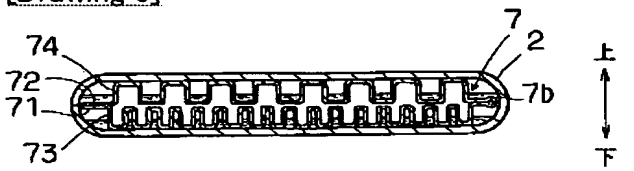
[Drawing 3]



[Drawing 4]



[Drawing 5]



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